

FAUNAL SURVEY OF NEW ENGLAND. I. INTRODUCTION AND GENERAL DESCRIPTION OF THE AREA

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ABSTRACT

This paper introduces forthcoming publications on faunal surveys in the New England region of New South Wales. It provides a short description of the general features of the New England region, and briefly summarizes the more comprehensive account provided by Lea *et al.* (1977), which should be consulted for maps and more detailed commentary. In future numbers of this series of faunal surveys, specific maps of the distribution of environmental features believed to be important in the biogeography of specific animal groups will be presented and discussed in detail as appropriate. However, future numbers will not recapitulate the general topics discussed here, and the present paper and the Atlas of New England (Lea *et al.* 1977) are expected to serve as a basic background of the more specific faunal surveys to follow.

INTRODUCTION

Since 1966 various staff and students of the University of New England have been participating in a faunal survey of the New England region. The original concept of the boundaries of the region of study was the Commonwealth Electorate of New England of 1975¹, and still represents the heart of the study area. However, later collecting was also carried out in adjacent areas outside the boundary and the study area has been widened for certain animal groups. The collecting area falls within latitudes 28°50'S and 31°40'S and longitudes 150°E and 152°40'E, and is marked within the map of New South Wales in Fig. 1. Grid cells of 'quarter-cell' size (5' x 5') of the 'Australian Biogeographical Integrated Grid System' (ABIGS) will be used as units for the recording of presence/absence for taxa from all animal groups. The ABIGS system is outlined in Brook (1977).

1. Note that this is a narrower concept of New England than that of Lea *et al.* (1977), who included, in addition to the New England Electoral District, that of Gwydir and parts of Comper, Lyne and Patterson as well.

The New England region represents a climatic and geographic crossroads, with a fauna containing elements with links to almost all of the major zoogeographic regions of Australia — tropical, southern temperate, and semi-arid species, together with some high altitude forms.

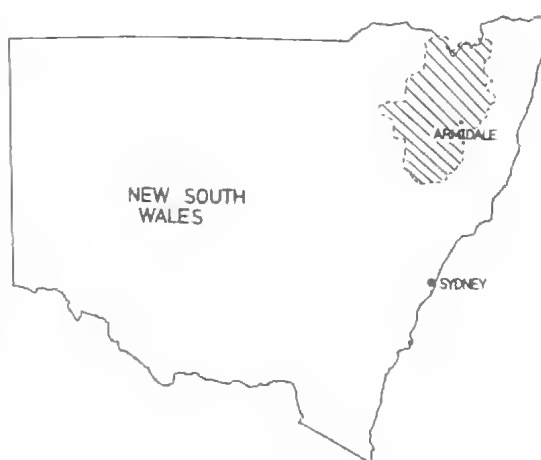


FIG. 1. Map of New South Wales showing the location of the New England region.

This diversity makes the area of great interest ecologically. The wide range of conditions should result in complex distribution patterns which, on comparison with environmental variables, can provide a good understanding of the limiting factors operating both at present and in the past. Distributional mapping and environmental correlation are important prerequisites for more detailed studies of the ecology and physiology of individual species or groups of species.

Also, the long history of farming in the New England region provides another dimension. The clearing of land, the grazing of sheep and cattle, and the growing of various crops have caused extensive habitat changes in some areas. Distributional mapping in conjunction with demarcation of farming types and intensities may elucidate any effects which agricultural practices have on fauna and would provide a background for any conservation measures.

The first few papers in this series will deal with the first groups studied (e.g. gastropods, frogs, lizards, tortoises, snakes, birds and Odonata). Collections of millipedes, centipedes, scorpions and pseudoscorpions have been assembled and

have either been sent to specialists for preliminary study or are waiting distribution to some-one expressing an interest. We are beginning to collect additional groups now. Any qualified persons wishing to participate in the survey by studying particular taxa should contact one of the authors. Available specimens can be supplied and/or an effort made to collect them in the future.

Originally the present introductory paper was envisaged to be a large one with a number of topographic, climatic, geologic, soil and land use maps together with an extensive commentary. However, the 2-volume work 'An Atlas of New England' edited by Lea *et al.* (1977) has presented many of the relevant data in more detail than we could hope to, and the present paper is a brief summary of the aspects of importance to zoogeography. An older compilation of essays (Warner 1963) also includes material on the region's geology, soils, vegetation and their interactions. A regional bibliography is presented by Greenwood (1976). Maps presented here include adaptations from those in Lea *et al.* (1977) and original maps of certain features not covered in the Atlas of New England. In all cases, the maps have the outline of the collecting grid (Fig. 2) superimposed on them. The Atlas of New England and its included references should be consulted for more detailed information. A comprehensive study of a small part of the area, Dumaresq Shire, has been presented by Woolmington (1965).

DRAINAGE

The Great Dividing Range separates the New England area into two major drainages, the eastern and the western. In most places the divide is not conspicuous and often occurs along rather gently sloping land below the level of adjacent ridges (Walker 1977). It enters a region just north of Walcha and passes northward through the centre of the district until about Glen Innes where it veers slightly northeastward leaving the district near its northeastern corner. All of the western streams eventually lead into the Murray-Darling system.

The northwestern section is drained by (a) the Beardy and Mole Rivers which join to form the Dumaresq River leaving the region at the extreme northwestern corner, and (b) the Severn River in the northwest corner near its junction with the final major river of the northwestern section, the McIntyre River. The central part of the west is drained principally by the Gwydir River, which exits via Copeton Dam. Finally, the southern part

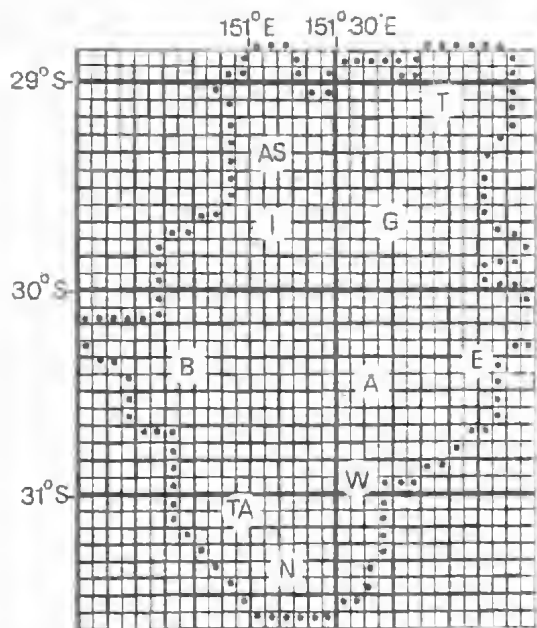


FIG. 2. Collecting grid across region of the survey which is enclosed by solid dots. AS = Ashford, A = Armidale, B = Barraba, E = Ebor, G = Glen Innes, I = Inverell, N = Nundle, TA = Tanworth, T = Tenterfield, W = Walcha.

of the western drainage is drained by the MacDonald and Peel Rivers which unite slightly downstream of Keepit Dam where they leave the area as the Namoi River.

The area of the eastern drainage included within the study region is only about one third as large as that of the western one (Fig. 3). Drainage within the extreme northeast is largely by the Timbara River and its tributaries, in the central part of the Henry, Sara, Oben and Aberfoyle Rivers, all of which drain into the Guy Fawkes River outside the region. All of these rivers eventually drain into the Clarence River. Further south, the Gara, Wollomombi and Styx Rivers eventually, in conjunction with a number of extralimital rivers, go to make up the Apsley-

Macleay system. At the extreme southeastern section of the region, the rivers form part of the Manning River system.

TOPOGRAPHY

Fig. 4 shows demarcations of altitude for the New England region. The area is largely an elevated tableland, the New England Plateau, bordered on the east by a precipitous scarp dropping to incised river gorges and the coastal plains, and more gradually descending on the west via the western slopes toward the western plains. Much of the tableland and its slopes are hilly or gently rolling although more contrasting relief is provided in places by the Great Dividing Range (New England Range) running north to northeast through the eastern part of the area, the Nandewar Range running northwest from the southeast part of the district, and the Moonbi Range south of and roughly parallel to the Nandewar Range. A variety of other less extensive ranges or individual mountains occur at

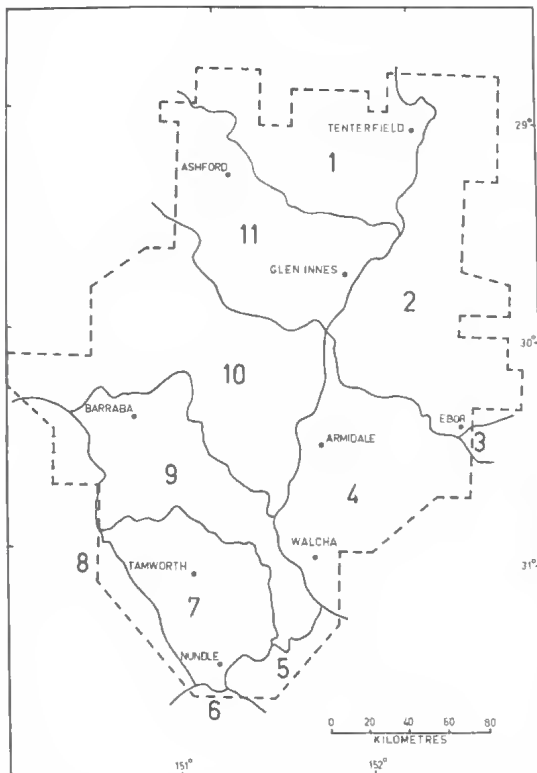


FIG. 3. Drainage Basins of the New England region. 1 = Mole, Beardy Rivers; 2 = Cataract, Timbarra, Mann, Henry, Sara Rivers — Clarence River; 3 = Bellingen River; 4 = Apsley, Macleay Rivers; 5 = Myall, Nowendoc Rivers — Manning River; 6 = Pages River; 7 = Peel River; 8 = Namoi, Mooki Rivers; 9 = Manilla, Macdonald Rivers; 10 = Copeton Dam catchment; 11 = Severn, McIntyre Rivers.

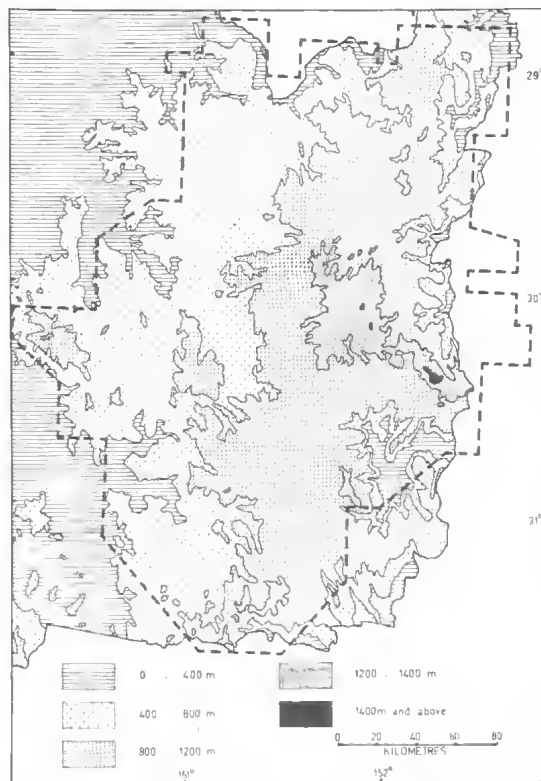


FIG. 4. Altitude — adapted from Walker (1977). (The collecting area is superimposed, inside the broken lines).

various places along the plateau (see map in Lea *et al.* 1977, volume 2, p. 1). Some of the eastern rivers are associated with steep-walled, deeply carved gorges, sometimes as much as 800 metres deep (Walker 1977).

Most of the area is characterised as having gentle to moderate slopes except the area of the ranges to which previous reference was made; these have steep slopes. Little of the study area can be generally classified as 'almost level' or 'flat' (Swan 1977).

Most of the plateau (the eastern part of the area) lies between 1000 and 1300 metres elevation, with the ranges or isolated mountains going up to more than 1500 metres. The western slopes are chiefly 600 to 1000 metres elevation with a few areas even lower, such as the northwestern corner and the Liverpool Plains along the southwestern edge. No part of the region is lower than 200 metres elevation.

CLIMATE

New England is a transition zone between the predominantly summer rainfall of the north and the predominantly winter rainfall of southern Australia. However, most rain falls in the summer under the influence of the moist summer easterlies, distant tropical cyclones, occasional low pressure areas moving down from the north and thunder storms; there is frequently a secondary, smaller winter peak associated with cold fronts from the south (Hobbs and Jackson 1977).

In general, the amount and duration of rainfall and mean annual number of days with rain are highest in the east decreasing toward the west owing to the joint effect of decreasing elevation and increasing distance from the sea. However, local topography and other variables have their effect and superimpose a somewhat more complex pattern of local variation (for maps see Lea *et al.* 1977, volume 2, pages 11 and 12).

Fig. 5 presents a summary map of mean annual rainfall for the area. However, there is considerable year to year variation and mean annual values are not necessarily indicative of rainfall for any particular year.

Evaporation, partly dependent on temperature, increases from a southeast to northwest direction. Thus not only is rainfall least in the northwestern part but evaporation is greatest there. Consequently the general moisture conditions are most favourable in the southeast and become progressively less favourable toward the

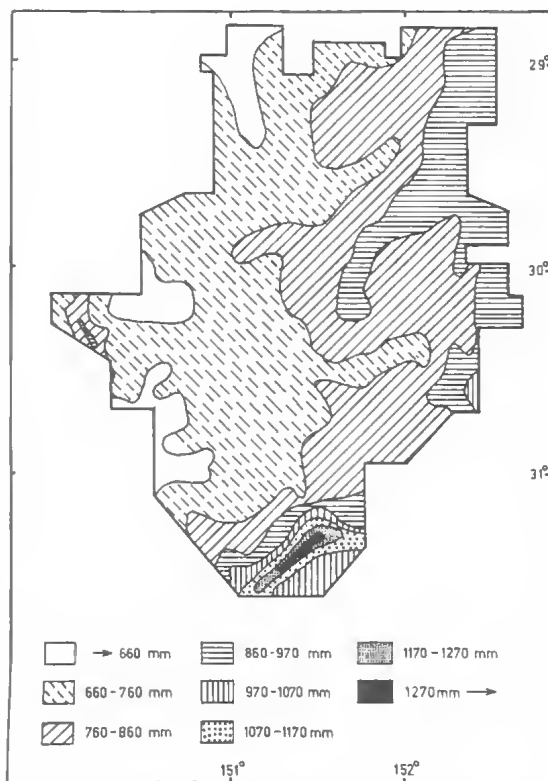


FIG. 5. Mean annual rainfall isohyets across the collecting area. (Compiled from many sources — see Reference Appendix I).

northwest (for maps see Lea *et al.* 1977, volume 2, page 12).

Temperature also shows regional variation within the area. Solar radiation in sunshine hours increases from southeast to northwest and consequently there is a general tendency for temperature to increase in the same direction (Hobbs and Jackson 1977). Fig. 6 shows some thermocline patterns across the region. (Further maps of temperature and sunshine are presented in Lea *et al.* 1977, vol. 2, p. 13). However, elevation, wind, type of air mass and a variety of other factors result in much local variation. The most extreme source of variation is seasonal. By Australian standards the New England region is cold in winter with a median frost period for the region as a whole exceeding 100 days per year (Hobbs and Jackson 1977) and mean daily minimum temperatures ranging from 0°–4°C during July to 12°–20°C during January. The lowest temperatures are centred over the higher altitudes along the north-south axis of the Great

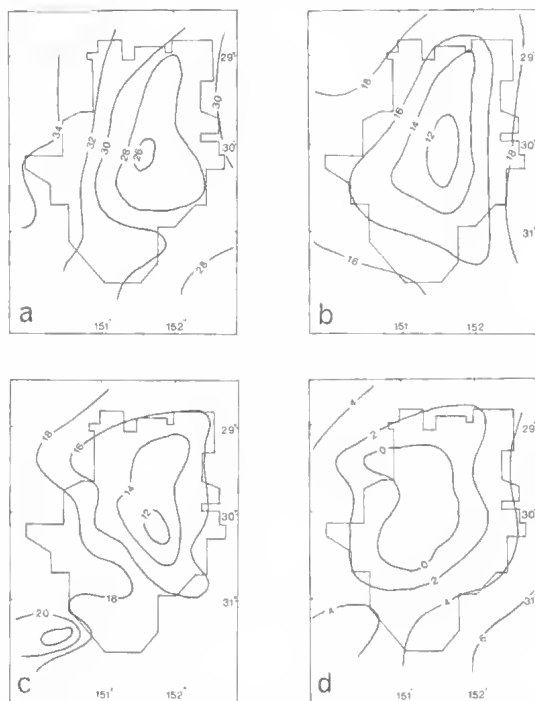


FIG. 6. Thermoclines across the New England region: (a) Mean daily maximum, January; (b) Mean daily maximum, July; (c) Mean daily minimum, January; (d) Mean daily minimum, July. (The collecting area is superimposed.)

Dividing Range in the east central part of the district, with milder ones radiating out from that area. Mean daily maximum temperatures for the area ranged from 12°–18°C in July to 28°–32°C in January. Again the colder areas are over the central part of the Great Dividing Range with hotter conditions peripherally from there. Thus the coolest, east central localities range from minima of about 0°C in winter to maxima of 28°C in summer and the warmer parts of the region from winter minima of 4°C to summer maxima of 32°C.

VEGETATION

Rain forest and wet sclerophyll forest occur only in the more humid eastern margins of the area. Even there, they do not form large continuous zones but occur rather as isolated areas interspersed with a more extensive open forest, dry sclerophyll. These forest types make up the major vegetation cover along the narrow eastern margin of the New England area but toward the west, except for scattered localities of

rather extensive dry sclerophyll, rapidly give way to a preponderance of either woodland (especially in the higher elevations and on the steeper slopes) or unforested habitat. Open scrub is rare, occurring only in a small area in the southwestern region (Smith and Turvey 1977; for map see Lea *et al.* 1977, volume 2, page 32).

The vegetation has been highly modified by man's activities especially in the areas of woodland and grassland areas which have been extensively subjected to grazing and the cultivation of crops (Fig. 7). There were grasslands in the area before the advent of European Man but these have been extended at the expense of woodland and forest. Wooded areas have also given way to cultivation, except for the still predominantly forested eastern fringe (Thorpe 1977, Smith and Turvey 1977; for map see Lea *et al.* 1977, volume 2, page 30). In recent decades many eucalypt trees which survived clearance for agricultural purposes have succumbed to the syndrome of New England dieback (Heatwole and Lowman in press).

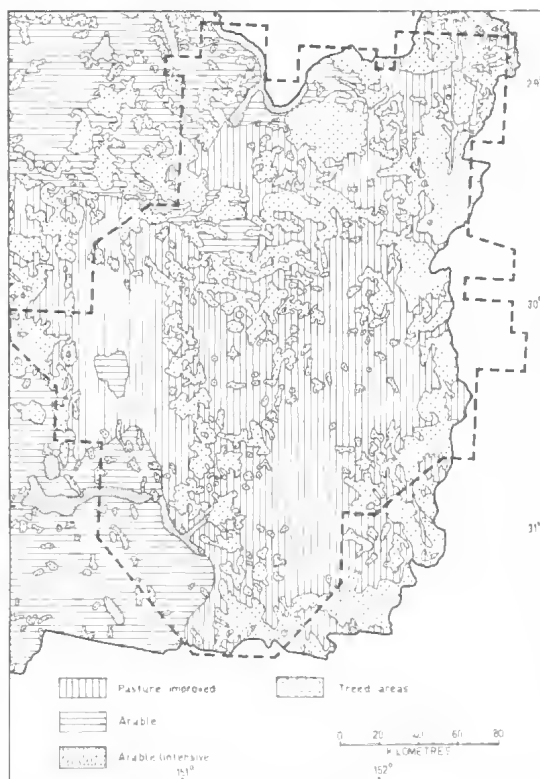


FIG. 7. Land use — adapted from Thorpe (1977). (The collecting area is superimposed, inside the broken lines).

GEOLOGY

The geology of the New England area has been described by Harrington (1977) — Fig. 8. There are late Mesozoic and Tertiary basalts with a north-south orientation running through the central part of the region but veering off to the west in the northern part of the district. On both sides of them and to the north of them, are extensive areas of granites and Paleozoic volcanics with 'granite' affinities. These collectively occupy the greater part of the New England region. The final major category of rocks is the Paleozoic basement of greywackes, cherts, volcanics and sandstones occupying the major portion of the southwestern and southern sections of the area but also well represented along the eastern and northern parts as well.

There are also small areas of serpentine and Tertiary and Quaternary alluvium in the southwest, and patches of Mesozoic sediments and volcanics in the southeast and northwest. The

geological history of New England is discussed by Warner (1971), and of the Eastern Highlands of which the region is a part by Ollier (1978).

SOILS

The soils of the New England region form a complex pattern and only a general survey of the broadest categories can be presented here. McGarity (1977) provides a more detailed summary and a general map is presented in Volume 2, page 9 by Lea *et al.* (1977). In the centre of the region is a north-south oriented region of Chocolate-Prairie soil, bounded on the north and southwest by one of the major soil associations in the area, the Yellow Solodic-Yellow Podzolic soils, occupying large areas in the north and in the centre of the region, giving way to the Yellow Podzolic Association towards the southeast. Another major category is the Yellow Podzolic-Gley Podzolic characteristically oriented in two large north-south bands, one to the east of Chocolate-Prairie soil and the other to the west of the central area of Yellow Podzolic-Gley Podzolic soil; there are also extensive areas of Yellow Podzolic-Gley Podzolic soils in the northeastern part of the region. In the extreme southwest is a large area of Red-Brown Earths intermingled with and bordered on the north, northeast and south by Non-calcic Brown soils. The extreme eastern edge of the region is characterised by a Red Podzolic soil. There are Black Earth-Euchrozem soils toward the north and northwest, and less extensive areas toward the southeast. Finally, there are small areas of Black Earth Prairie soils scattered among the various other types, especially in the central, northwestern and southwestern areas, and a small pocket of Krasnozems-Chocolate soils in the extreme south. Skeletal soils are scattered throughout much of the area.

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Mr A. Dudatis and Ms J. Simpson assisted by way of preparation of some of the figures. Mrs Viola Watt and Ms Sandra Pont typed the manuscript.

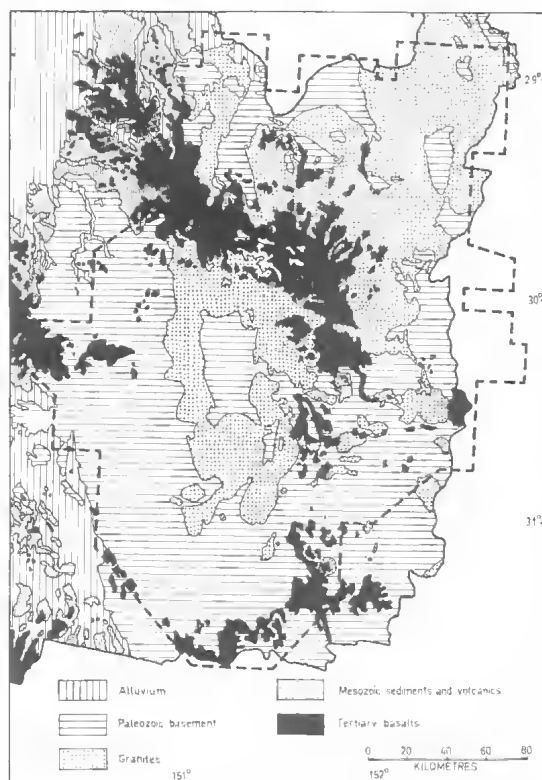


FIG. 8. Geology — adapted from Harrington (1977). (The collecting area is superimposed, inside the broken lines.)

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APPENDIX 1

SOURCES USED IN CONSTRUCTING MEAN ANNUAL RAINFALL ISOHYETS OVER THE NEW ENGLAND REGION

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